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the line of nodes. According to my elements,[1] the star B will pass the ascending node in April, 1915. Since the date of periastron is 1916.27, only a year later, the orbital velocity is now very rapid and the companion will traverse 180° of true anomaly and reach the descending node by April, 1917.

It follows that a series of spectrographic measures beginning at the present time and extending over the next three years will give both the maximum and the minimum radial velocity of the brighter star A, and be of the greatest service in correcting the orbit elements.

ϵ *Hydræ,* it will be remembered, is at present the only binary system whose elements can be determined both by micrometer measures and by measures of radial velocity. Measures which I secured on two nights with the 36-inch telescope gave the position: 1914.26 $265^\circ.4$, $0''.20$, in good agreement with that predicted by my orbit. The angular distance is diminishing rapidly and will reach the minimum of about $0''.08$ early in 1916. It will hardly be possible to secure reliable micrometer measures after April, 1915, until the companion is near the descending node in 1917. This fact adds to the importance of securing good measures of the radial velocity in that interval.

R. G. AITKEN.

September, 1914.

THE BRIGHT-LINE STAR A. G. C. 22748.

$(\alpha = 16^h\ 44^m.5;\ \delta = -41^\circ\ 4'.)$

This star was discovered to have bright lines in its spectrum by Mrs. FLEMING in 1889 from the study of the Harvard College Observatory objective-prism plates taken at Arequipa, Peru. When the designation "fifth type" was suggested by PICKERING in 1891 for the thirty-three bright-line stars then known, he placed this star in the second of three divisions, differing as to the widths and intensities of the lines, and remarked that the lines appeared to be *Orion* lines, bright instead of dark. The star is included in the list of Wolf-Rayet stars observed in 1894 by CAMPBELL, who noted the bright lines at 4690 A and 4637 A and the bright borders to Hγ 4340 A and Hϵ 4473 A. In 1898 Harvard College Observatory reported the presence in the star's spectrum of the additional dark hydrogen lines Hζ', Hϵ', Hδ', Hγ', and a "bright double band" at 4633 A. Miss CANNON'S classification of 1900 places it in Class Oe, which is characterized by the two bright bands 4633 A and 4688 A, numerous dark lines, the strongest of which are those of the hydrogen series from Hβ to Hθ, the additional hydrogen series Hγ', Hδ', Hϵ', Hζ', which were first found in ζ *Puppis,* and the helium lines 4026 A, 4120 A, 4471 A, 4712 A. Her descriptive remarks are: "The bright band 4688 is half as wide and half as intense as in A. G. C. 9311, the typical star. Hβ is faint and dark and bright on red edge. Line 4514.5 A is bright on violet edge. A bright line is present at 4490 A. Band 4633 A is widely double." Lastly, the star is included in the list of fifth-type stars in Mrs. FLEMING'S collection of *Peculiar Spectra,* dated 1912, with the remark: "Band 4633 A is double."

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[1] See *Publications A. S. P.,* **24**, 216, 1912.

A more detailed study of this star than has previously been published is presented in the recent *Lick Observatory Bulletin,* No. 257. It deals with the results of the measures of three plates taken with the two-prism spectrograph of the D. O. Mills Expedition at Santiago, Chile, on the dates 1908 July 20, 1910 July 30, 1912 August 12. The measures of the helium line 4471.676 A on each plate gives a velocity of between 50 and 60 kilometers toward the Sun. Nearly all the lines and bands visible on the plates are identified with previously announced stellar wave-lengths. Six bright lines and three dark lines were measured and their wave-lengths deduced. These wave-lengths and descriptive notes for all the lines and bands are given in tabular form in the *Bulletin.* The particular points which have not before been noted are: The pair of lines at 4634.7 A and 4641.8 A appear as two unrelated lines, rather than as a "double 4633 A." The dark line at 4514 A is probably bright on the red edge at 4517.2 A, rather than on the violet edge, since the bright line at 4504.7 A appears farther from the dark line than that at 4517.2 A. An inconspicuous bright line appears at 4486.3 A and may possibly be a bright border to a very faint and broad absorption band at about 4482 A. The hydrogen lines Hγ and Hδ are bright on the red edge, as well as Hβ, which alone is bordered in the typical star of Class Oe,—namely, A. G. C. 9311. As in the latter, Hβ is not so strong as Hγ and Hδ. Slight brightening is present on the red edge of Hγ', 4542.1 A, and He 4471 A, but it is presumably not as conspicuous as in A. G. C. 9311 and A. G. C. 22843, respectively. The bands 4634.7 A, 4641.8 A, and 4686.3 A are each about 3.5 angstroms in width. The first two are equally intense and somewhat stronger than 4686.3 A. The two dark lines at 4089 A and 4096 A have recently been ascribed by Miss CANNON to argon.

The distinctive features of this star's spectrum are the several bright lines or bands which are characteristic of the Wolf-Rayet stars, the numerous wide dark lines which are characteristic of the *Orion* type stars, and the bright borders of the hydrogen and helium lines which are characteristic of the bright-line stars of Classes B to A. These features aid in establishing the connection of the Wolf-Rayet with the early type stars, a connection quite certain but not fully understood.

G. F. PADDOCK.

September, 1914.

RELATION OF THE MOUNT WILSON PHOTOGRAPHIC AND PHOTOVISUAL MAGNITUDE SCALES.

With the aid of an objective-grating attached to the 60-inch reflector, HERTZSPRUNG has determined the effective wave-lengths of about two hundred stars in the cluster N. G. C. 1647. He has also provided data by means of which the color indices of the individual stars may be calculated from their respective effective wave-lengths.

Since color index is by definition the difference between photographic and visual (or photovisual) magnitude, it follows that a comparison of color indices derived from magnitudes with those calculated from effective wave-lengths affords a control upon the mutual relation of the photographic and visual magnitude scales. The test is the more important in that it can be applied to relatively faint stars. There is no particular difficulty in establishing the two scales so that, in accordance with international convention, they coincide at the sixth magnitude for stars of spectrum A0. But when this has been accomplished, it is difficult to find assurance that they